Installation Manual for CS1000 / CS1001 VDN *DualCom* Mk1 & 2

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VDN *DualCom* Mk1 and Mk2 Installation Manual

Description

VDN Dualcom is an advanced auto-dialling Digital Communication Device for secure alarm reporting. It can transmit alarm signals to an Alarm Receiving Centre using the PSTN (Public Switched Telephone Network) or VDN (Vodafone Data Network).

When *Dualcom* is triggered by the alarm system it initiates calls to the Alarm Receiving Centre over both communication paths simultaneously. Once it has received an acknowledgement signal from one path it clears the calls on both paths so that the Alarm Receiving Centre receives only one alarm notification. Test calls are delivered using both paths to test the system fully.

Dualcom monitors both communication paths continuously. A fault on one path is reported to the Alarm Receiving Centre using the other functioning path. Any Alarm System bell delay is maintained unless both paths are in fault, or the Alarm Abort feature (if programmed) is used.

Dualcom includes an internal battery that ensures continued reporting and monitoring even in the event of a total power failure to the *Dualcom*.

Dualcom comes complete with Alarm Abort feature to enable older alarm systems to comply with the ACPO false alarm policy. Once the system is set, if a mis-operation occurs and the system is unset within 90 seconds, a restore on channel 3 or separate code will be sent to the Alarm Receiving Centre. If programmed, a Tellback will also reset the control panel.

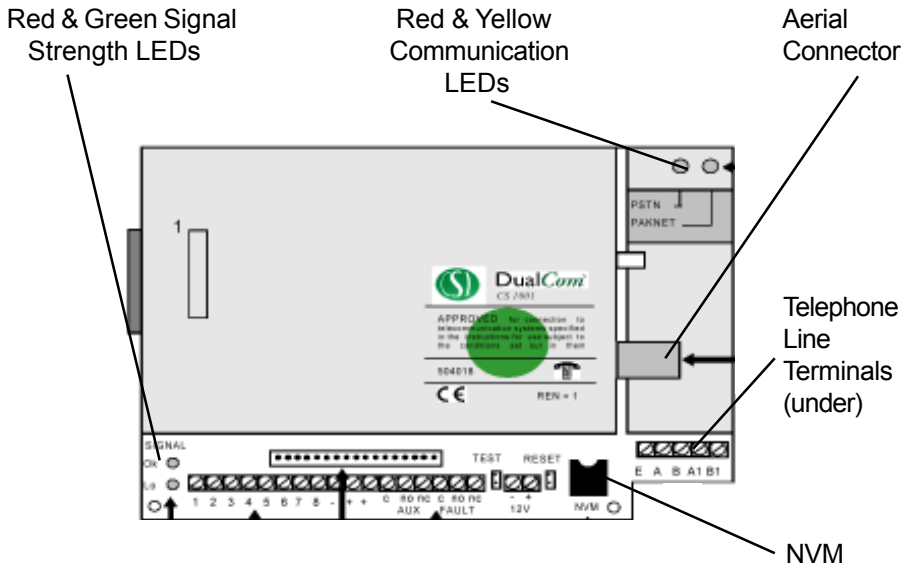
Dualcom is available in two versions; Stand alone and Plug-on. A tamper protected steel box with an integral 1 amp power supply is also available. *Dualcom* is housed in an ABS plastic case which protects the electronics and meets PSTN safety requirements. *Dualcom* has 8 alarm inputs. This can be expanded to 16 by adding a plug-on module which also provides 8 outputs. For part numbers of these accessories, see over.

Note: Throughout this manual the Paknet data communication network operated by Vodafone is referred to as the VDN (Vodafone Data Network).

Part Numbers

CS 1000-20	*VDN Dualcom* Mk2 Stand Alone (including aerial).
CS 1001-20	*VDN Dualcom* Mk2 Plug On (including aerial).
CS 1050	Expansion to 16 inputs & 8 outputs.
CS 1500	Tamper protected box with 1 amp Power Supply.
CS 1051	Installers VDN Signal Strength Test Set
CS 1052	Wireless Signal Strength Meter for use with CS1051
CS 1053	High-gain Aerial
CS 1054	Downloading software and NVM Programmer
CS 1055	Pack of 10 NVM EEproms
CS 1056	10m VDN aerial extension lead
CS 0300	Heavy Duty Lightning/Surge Suppressor
CS 0380	Replacement Internal Battery for *VDN Dualcom* Mk2
CS 0700	ISDN - Analogue Converter
CS 0402	CSL Products CD with manuals for all products

There is a lot of technical information in this manual. For trouble-free installation it is essential to follow the site survey and installation recommendations on pages 5-8.



VDN Dualcom Mk1 Stand Alone

Fig 1

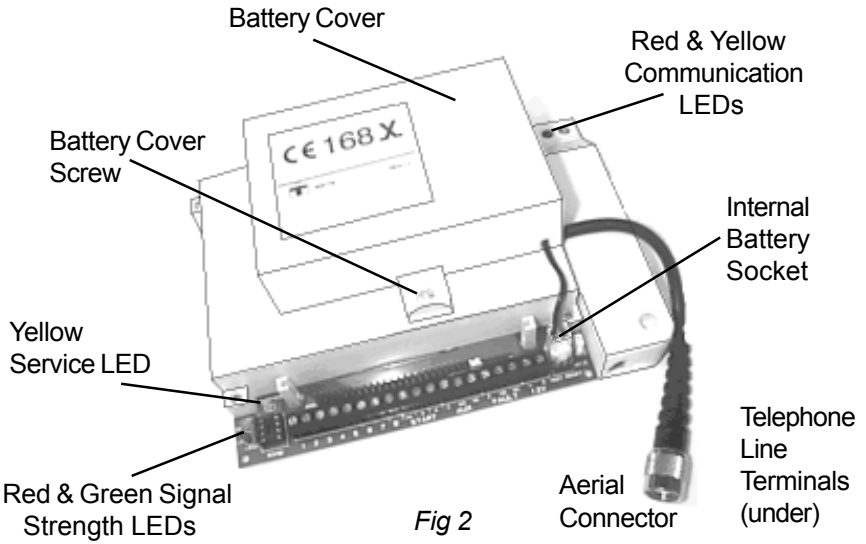


Fig 2

VDN Dualcom Mk2 Stand Alone

Site Survey

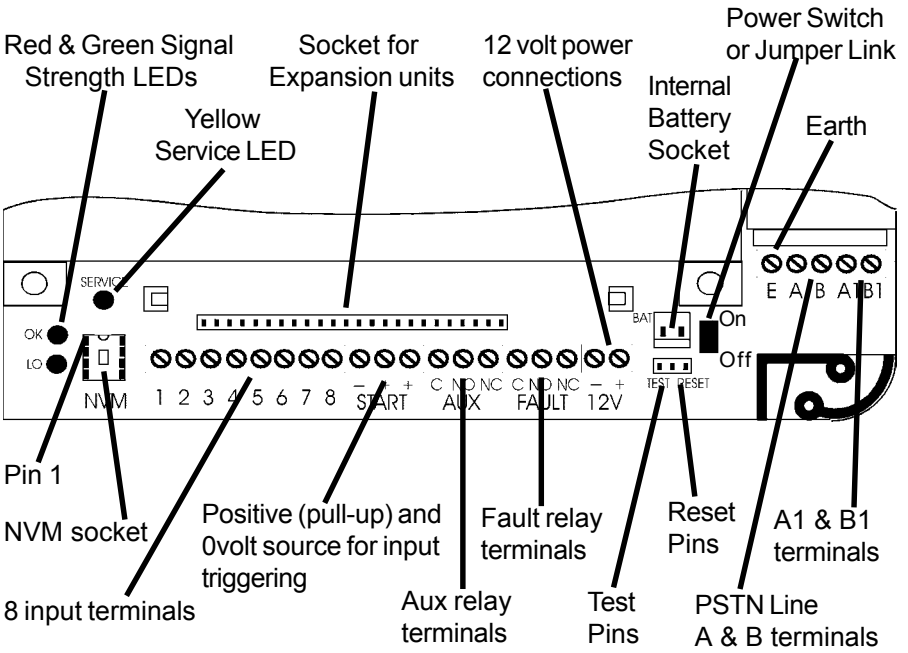
It is strongly recommended that a Site Survey is conducted prior to installation of a VDN *Dualcom* to confirm that adequate VDN signal strength is available at the site.

Call a Help Desk. See page 10. Ask for a VDN signal strength prediction. For this, you will need to have the Post Code of the site available. This will tell you if there is VDN radio coverage at the proposed site.

If there is no VDN radio coverage at the proposed site, the *Dualcom's* VDN alarm reporting path will **not** operate. If your GSM mobile telephone operates at the site you could consider using a CS2000 GSM *Dualcom*. Contact CSL for more information.

You can use a *Dualcom*, aerial & fully charged battery to survey the proposed site for the point of strongest signal. You can also use a portable CS1051 or 'Pakit' test set to show the VDN signal strength at the proposed site.

See Page 11 'Aerial Siting' for more information. Make a note of this point and use it when installing the *Dualcom* aerial.



VDN Dualcom Mk2
Fig 3

Installation

1. Assemble the aerial by screwing the metal rod and the flexible aerial into the mounting bracket. Site the aerial **vertically** at the point of strongest signal ensuring that it is within the protected area. This is usually the highest point in the building and will have been identified during the site survey. Avoid metal roofs or installation within metal skinned buildings. See Page 11, 12 & 35.

2. Totally power down the control panel mains and battery.
   Where required, fit the CS1050 Expansion Board. See page 19.

3. Program the NVM for the system requirements or obtain a programmed NVM from your ARC. See page 33. Fit the NVM into the 8 pin socket on the *Dualcom*. (NVM indent towards the Service LED). See Fig 1 and 2.

4. If you are installing a CS1001 Plug-On *Dualcom*, plug the unit onto the control panel pins ensuring they are correctly aligned.

5. If you are installing a CS1000 Stand Alone version of *Dualcom*, connect the input triggers. See Appendix 2.

6. Connect to the relays “Fault” and “Aux” as required. See page 20.

7. Connect the aerial to the *Dualcom* aerial lead using the threaded connector provided. See Fig 1 and 2.

8. Connect the PSTN line to the terminals provided under the protective cover. Only ‘serial connection’ is recommended for other equipment using the same telephone line as *Dualcom* in security installations. See Pages 21 to 29.

9. *Dualcom Mk2*, ensure that the Power Switch is in the **Off position** or that the **Power Jumpe**r is **removed.** See Fig 2.

10. *Dualcom Mk2*, connect the internal battery onto pins provided. See Fig 2.

11. On both CS1000 Stand-Alone and CS1001 Plug-On *Dualcom,* connect the ‘12v +’ & ‘12v -’ terminals to the Control Panel or Power Supply 12 volt output (e.g. Aux supply’ or ‘DC power). See Fig 1 & 2 and page 30-32.
    The **installer must ensure** that the Alarm System power supply is rated to provide **adequate power**. *Dualcom* requires a minimum of 230mA.

12. Note the *Dualcom* ESN & NUA numbers, security access numbers, etc.on the site records that will be stored at your office. See Fig 4 and page 16. See also Polling, page 15.

13. The *Dualcom* is now ready for testing.

System Testing

Ensure you have informed your Alarm Receiving Centre that you are ready to test your Dualcom Product.

1. Reconnect the mains supply to the control panel.

2. ***Dualcom Mk2***. Move the Power Switch to the On position (See Fig 2). Note that the power switch may be a yellow slide switch or a removable jumper link. This will power-up the *Dualcom* and 'register' it onto the VDN network. Registration will take about 45 seconds with the Radio LED On, the SERVICE LED flashing and the Signal Strength LEDs Off. See page 17.

   Whenever you apply power to the *Dualcom* (using the Power Switch/Jumper or by shorting the Reset pins) during installation or during a regular maintenance visit, the *Dualcom* will 'register' onto the VDN network. See page 18.

   Dualcom Mk1. Press and hold the black TEST button. Connect power to the Dualcom. Keep the TEST button held until the SERVICE LED starts to flash. Release the TEST button. See page 17 and Fig 6.

   Note: If the NVM is an incorrect type, faulty, fitted incorrectly or has been incorrectly programmed, the Red and Yellow Communication LEDs will flash alternately. If there is a problem with the VDN radio path, the Yellow Communication LED will flash. If there is a problem with the PSTN telephone line, the Red Communication LED will flash. See Appendix 1 for LED fault indications.

4. To test **both** reporting paths to the ARC, momentarily short the Test pins on the *Dualcom* see Fig 1 and 2. This will cause *Dualcom* to send a test signal to the ARC on **both** the PSTN telephone path and the VDN radio path.

   Once the test pins are shorted, the two communication LEDs will illuminate, (Red for PSTN and Yellow for Radio). During communication the LEDs will indicate the progress of the call, see Appendix 1. When a path has successfully communicated with the ARC its associated LED will go off.

   During Test calls (started using the Test pins), **both** paths will send a test call. The ARC should receive **two** test calls.

   Ensure after the test that both Radio and PSTN LEDs are off; this will mean that the test calls on both paths are complete.

5. Now trigger all the used inputs on the *Dualcom.* This should be done by Setting the Control Panel and triggering an alarm condition. If P/A or Fire circuits are being monitored these should also be triggered and tested.

System Testing (continued)

6. If you are using the Alarm Abort feature, set the Alarm Panel, initiate an alarm condition and (If the alarm system incorporates bell delay this will be overridden) unset the alarm system within 90 seconds.

7. Contact your ARC to confirm that all signals have been received. Ensure that all 'Restore' signals are received when the *Dualcom* input terminals return to their quiescent value.

8. If the quiescent (non-active) states of the input terminals are incorrect, i.e. 'positive applied/removed is inverted, then the ARC will report that the Alarm/ Restore or Open/Close is the 'wrong way round. To correct this, on *Dualcom Mk2*, use the Self Learning Input feature. See page 13.
   For *Dualcom Mk1*, contact the ARC or the Help Desk at CSL for remote programming.

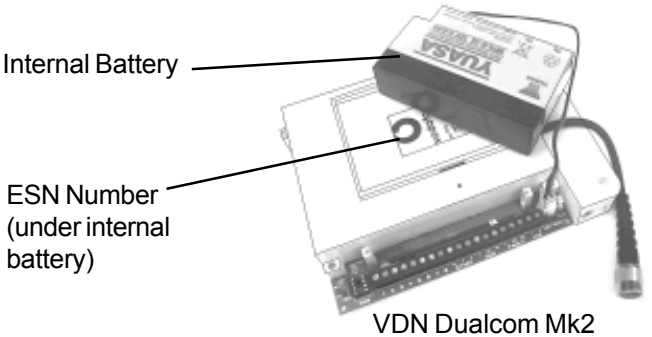
   Note : When ALARM calls are made, both PSTN & VDN paths are activated, but only ONE alarm call will be received. This will be from the path that is the first to send the alarm call to the ARC.

9. If at any time you wish to cancel a call, short the Reset pins. See Fig 1 & 2.

10. Remember to note the *Dualcom* ESN & NUA numbers (and any security access numbers) on the site records that will be stored at your office. See Fig 3 and page 14.

11. Your *Dualcom* is now fully tested.

Note: **When transporting *Dualcom* Mk2 ALWAYS disconnect the internal battery to stop the battery operating the *Dualcom* until it is discharged. See Fig 2 and 3.**



VDN Dualcom Mk2

Fig 4

Troubleshooting

Q. What if the VDN radio path signal has not been received by the Alarm Receiving Centre ?

Check that the NVM is fitted & has been correctly programmed.

Check with a meter that the voltage supply to the Dualcom is 12v or more and does not dip when the Dualcom is signalling.

Check, using the Signal Strength LEDs (Red & Green) or the CS1052 that the radio signal is sufficient and the VDN path status = OK.

Contact a Help Desk or use Direct Check to measure the signal strength that is received at the base station.

Check the aerial for connection and insulation.

See Appendix 1 for VDN fault indications. These will help diagnose radio path problems.

Q. What if the Telephone Path signal is not received by the Alarm Receiving Centre ?

Check that the NVM is fitted and has been correctly programmed, i.e. PSTN enabled, correct telephone numbers etc.

Check that the PSTN line is properly connected. Check with a meter that approximately 50 volts DC is present across the PSTN terminals marked A and B. Connect a telephone to the PSTN line and make a call to the ARC to ensure that the PSTN line is fully functional. Remove telephone after test.

Disconnect any other equipment that is using the same PSTN line to ensure that it is not inhibiting the Dualcom.

Check that when the Digital Communicator is triggered, the voltage across the A and B terminals drops to between 6 and 12 volts DC.

Ensure that 'call barring' to the ARC Receiver telephone number has not been set on the PSTN line used by Dualcom.

See Appendix 1 for Line Monitoring indications. These will help diagnose line problems.

Q. What if there appears to be random triggering of the *Dualcom* ?

Ensure that 0 volts is common across all parts of the alarm system.

If the Dualcom receives its power from a Power Supply that is additional to the alarm system, ensure that the 0 volt connection on the additional power supply is connected to the 0 volt connection on the alarm system.

Q. What if up/downloading does not work ?

Check that the NVM is fitted and has been correctly programmed.

Ensure that the CS1052 Plug-on Wireless Signal Strength Meter is not fitted to the Dualcom.

Help Desk

If you have installed the *Dualcom* in accordance with these instructions, checked all the above points but are still experiencing problems you can contact your *Dualcom* supplier, your Telecom Service Provider or your VDN Service Provider. Please have your ESN number to hand. See Fig 1 & 2 and page 16.

In UK, VDN network questions may be addressed to:
The Vodafone VDN Help Desk:
Tel: 08700 700 600 (Option 2 = Help Desk Operator)

In UK, *Dualcom* installation, programming, operation or other questions may be addressed to:
The CSL Technical Support Desk:
Tel: 01895 474 444
Email: support@csldual.com

The CSL web site: *www.csldual.com* contains the latest copies of all manuals for all CSL products. Please ensure that you are working from the latest version. You can also download associated information and software samplers. Sales, shipping and contact information is here too.

A CD is available that contains all manuals for all CSL products and the programming software for *Dualcom*. Contact CSL Technical Support for more information.

Aerial Siting

ALWAYS do a site survey to find an area of strong signal **before** installation.

The aerial should be mounted **vertically** at the point of strongest signal. This is usually the highest point in the building (often the loft area). Remember, for security reasons, the position chosen should be **inside** the protected area.

Large metal structures can affect radio signals. Avoid installing the aerial directly under metal roofs or within metal skinned buildings because this **will reduce the signal strength and may inhibit operation completely.** If this is unavoidable, the strongest signal will be found away from the metal roof or close to large external windows or skylights.

Avoid installing the aerial close (2 metres) to cable runs, ducting, structural metalwork, metal pipes, water tank, electronic equipment, e.g. photocopiers, fax machines etc. These can have similar effects as metal roofs.

The Signal Strength LEDs on the front of the *Dualcom* (see Fig 1 & 2 and Appendix 1) will give an indication of FSSI signal strength. This is the signal strength that the *Dualcom* is receiving from the VDN Base Station. These will **not** work with an unprogrammed NVM.

Green On:	High Signal Strength
Red & Green On:	Medium Signal Strength
Red On:	Low Signal Strength
Red & Green Off	No signal available.

You can use a *Dualcom*, aerial and fully charged battery to survey a proposed site for the point of strongest signal. Ensure that the *Dualcom* is fitted with a programmed NVM and is fully operational. Walk around the site carrying the *Dualcom*, aerial and battery observing the signal strength LEDs. When you have identified the point of the strongest signal, make a note of this point (accurate to 20cm) and use it when installing the *Dualcom* aerial.

To achieve a more accurate reading, we strongly advise that a RSSI test (signal strength received by the base station) is performed. A reading of +15 or higher is strongly recommended.

CSL can provide the CS1051 Installers Radio Test Set. The CS1051 may be used to align the aerial for maximum signal strength. It will also identify sources of interference and test the integrity of the radio path. See page 14. Contact a Help Desk for more information.

CSL strongly recommend the use of this test unit when installing VDN *Dualcom* products.

Aerial Siting (continued)

Reliable operation is unlikely with a low signal strength. If the signal strength LEDs, RSSI or FSSI readings show that the signal strength is low, you should improve the signal strength. This may be achieved by repositioning the aerial or fitting a higher gain aerial (CSL part number CS1053).

Where the aerial has to be installed some distance from the *Dualcom* a 10m aerial extension lead is available (CSL part number CS1056).

To check the RSSI, choose one of the following options. In all cases please have the Dualcom ESN to hand before phoning. This may be found on a label on the *Dualcom*, under the battery on *Dualcom Mk2* and on the end label of the *Dualcom* packaging. See Fig 1 and 2.

1. Phone the automated Direct Check service on 08704 505 805 (see below).
2. Use the CS1051 Radio Test Set. See page 14.
3. Phone the Vodafone Data Network Help Desk. See page 10.
4. Phone the CSL Technical Support Desk. See page 10.

Remember: It is **always** easier to find the point of strongest signal **before** the equipment is fitted to a wall. Moving aerials, cables, trunking etc. after installation is wasted time and effort.

VDN Direct Check

A telephone service called *Direct Check* is available that will tell you the RSSI signal strength of a registered *Dualcom*. *Direct Check* is an automatic service that you control using a telephone keypad or speech commands. All calls are charged at the UK standard 'b' rate.

To use *Direct Check*:

1. Note the ESN of the *Dualcom*, See Fig 4.

2. Make sure that the aerial is assembled correctly, stationary, **vertical** and that the *Dualcom* is powered correctly.

3. Dial Direct Check on 08700 700 600

4. Select 'signal strength checking' using the keypad or by speaking into the telephone and then enter the ESN number in the same manner.

5. The signal strength will be spoken to you.

Inputs and Self Learning

For full Inputs connection information see Appendix 2.

To aid installation, ***Dualcom Mk2*** can learn the quiescent state of its inputs, i.e. the 'not active' state, without having to re-program the NVM.

Note: ***Dualcom Mk1*** does **not** have self learning inputs. Contact the ARC or the CSL Help Desk for remote programming.

Self Learning allows the unit to be programmed **during installation** with 'positive applied' or 'positive removed' inputs. It will correct NVMs that have been supplied with incorrect input polarities.

1. Setup the inputs 'non-active' conditions by connecting a positive voltage or 'no' voltage (0v) on each input terminal as required. This is easily achieved by connecting the control panel outputs to the *Dualcom* inputs, then put the control panel in the **day state** with **no activated detectors and all alarm conditions reset**. You can leave any unused *Dualcom* inputs disconnected.

   'Non-active' means that the voltage on the alarm inputs are in the 'not in alarm' condition and open/close inputs are in the 'open', 'unset' or 'day' condition.

   Ensure that the **unset/open/day state** is selected on the Control Panel, **not** the 'set' or 'engineering' states.

3. With the *Dualcom* powered-up, apply a permanent short to the Test pins with a jumper link or screwdriver blade etc.

4. Momentarily short the Reset pins.

   The Red & Yellow LEDs will flash: 4 Red...4 Yellow...4 Red...etc. indicating 'learning' mode.

5. Remove the short on the Test pins.

   The LED flashing will cease and the state of the 8 inputs will be remembered as the 'non-active' condition. This information will be stored in the NVM.

   Note: DO NOT park the Jumper Link onto BOTH Test pins because this will immediately trigger a test call and inhibit further operation.

Dualcom Mounting

Dualcom is available as a 'stand-alone' or 'plug-on' version.

The plug-on version is specifically designed for fitting to Control Panels that are equipped with standard communicator mounting pins. Contact the CSL Technical support Desk for the latest list of Control Panels that may be used. See Appendix 3.

The stand-alone version of *Dualcom* may be mounted in a boxed power supply or other suitable case. The CS1500 boxed one-amp power supply is ideal for this. The case has mountings and screw retainers for a *Dualcom*, space for a 7 amp/hour battery and plenty of room for wiring.

Alternatively, any suitably sized case may be used. The *Dualcom* has two mounting lugs fitted to its case for screw fixing.

Using the CS1051 Radio Test Set

The CS1051 is a complete test set for all aspects of VDN radio, convienently housed in a rugged brief-case. It is supplied complete with all connectors, mains and car charger, aerials, manual and a 25 minute training video. An optional Wireless Signal Strength Indicator is also available. See below.

The Radio Test Set may be used to align the aerial for maximum signal strength. It will also identify sources of interference, test the integrity of the radio path, and provide signal strength readings.

The use of this Test Set for all VDN *Dualcom* installations is strongly recommended. For more information, contact CSL.

CS1051 Radio Test Set

CS1052 Wireless
Signal Strength Meter

Fig 5

CS1052 Wireless Signal Strength Meter

The CS1052 may be used with the CS1051 Radio Test Set to align the aerial for maximum signal strength.

This small hand-held unit allows the aerial to be aligned even when the Radio Test Set is connected to the aerial lead at the Dualcom's location and the aerial is located in another part of the building. See Fig 5.

The use of this optional addition to the Radio Test Set is strongly recommended. For more information, contact CSL.

Dualcom Polling

In addition to *Dualcom* continuously monitoring the VDN radio path to its base station, the VDN network regularly tests communication with every *Dualcom*. This is called polling.

If polling detects that there is a communication failure, then the relevant ARC will be allerted, enabling corrective action to be taken. Polling failure may also be reported after an extended power failure to the *Dualcom*. see page 30-32 for details.

To enable any problems to be quickly and correctly resolved, you should:

1. Ensure that the ARC is kept informed of new and replacement installations and the ESN & NUA numbers of the equipment that is installed.
2. Ensure also that the installers details are correctly recorded at the ARC.

All *Dualcom* products are normally polled hourly by the VDN. Polling failure will be reported to the relevant ARC directly onto their polling RPM (or FEP) equipment or by a fax from Vodafone.

Contact your ARC or a Help Desk for more information.

ESN Number

An ESN number uniquely identifies each *Dualcom*. It is the Electronic Serial Number. It is like the ‘chassis number’ on the metal chassis of a car.

On *Dualcom Mk1*, the ESN number number may be read from a label on the outside plastic case of the unit.

On *Dualcom Mk2*, the ESN number number may be read from the label that is under the internal battery. To access it, remove the battery-cover screw, lift the tab at the front of the battery cover and lift out the battery. See Fig 2.

On *Dualcom Mk2*, to replace the battery, position the red and black wires in the lid cut-out, clip the back of the battery lid onto the *Dualcom*, lower the lid tab and replace the screw.

NUA Number

The NUA number identifies the user that the *Dualcom* is registered to. It is the Network User Address. It is like the Registration Plate (Number Plate) on the front and back of a car.

If one number is known then the other may be found from records at CSL or Vodafone. These may be obtained by calling a Help Desk. See page 10.

It is strongly recommended that the *Dualcom* ESN & NUA numbers, security access numbers, etc. are recorded on the site records that will be stored at your office. See Fig 2.

Dualcom Mk1 Registration

These Registration instructions are for VDN Dualcom Mk1 only.

Dualcom **must** be 'registered' onto the VDN communications network before use. If un-registered, *Dualcom* **can not** send alarms to the Alarm Receiving Centre via the Paknet network and 'up/downloading' will **not** operate. Signal strength readings may also fail or be incorrect.

Always re-register the *Dualcom* whenever it is moved to a new location and during regular maintenance visits. To register *Dualcom Mk1* follow the steps below:

1. Remove power from *Dualcom Mk1*.
2. Push and hold the TEST button on the end of *Dualcom Mk1*. See Fig 1 and 6.
3. Keep the TEST button pushed, and connect power to *Dualcom Mk1*.
4. Keep the TEST button held for a further 5 seconds or until the SERVICE LED next to the TEST button starts to flash. You may now release the TEST button.
5. The SERVICE LED will continue to flash for about 25 seconds. It should then remain on solid. This indicates that registration is complete and *Dualcom Mk1* is 'locked' onto a VDN base station.

If the SERVICE LED does **not** remain on solid after 25 seconds, registration has failed. This is normally due to low (or no) signal strength. If the site survey and radio signal strength prediction (see page 4) indicated a suitable signal strength, check the aerial connections, power supply, signal strength LEDs and then repeat the registration procedure.

During registration:
1. *Dualcom* logs (up to 14) base stations that it can hear.
2. *Dualcom* will 'lock' onto the base station with the strongest signal.
3. The VDN network enables the *Dualcom* to send alarms.

All of these three functions **must** be completed before registration is successful and signals can be passed to the ARC.

Fig 6

Dualcom Mk2 Registration

These Registration instructions are for VDN Dualcom Mk2 only.

Whenever you apply power to the *Dualcom* by:
a). Moving the Power Switch to the On position.
b). Connecting the power supply **and** pluging-in the internal battery.
c). Briefly shorting the Reset pins.
the *Dualcom* will 'register' onto the VDN network.

Moving the Power Switch to the Off position will disconnect the external supply **and** the internal battery thus fully powering-down the *Dualcom*.

Always re-register the *Dualcom* (by briefly shorting the Reset pins) whenever it is moved to a new location and during regular maintenance visits. Re-registering allows the *Dualcom* to recognise any new base stations that may have been commissioned in your area.

To register *a Dualcom*:

1. Connect power to *Dualcom* or briefly short the Reset pins.

2. The SERVICE LED will start to flash and the VDN LED will be on solid. The SERVICE LED will continue to flash for about 45 seconds. It should then remain on solid and the VDN LED will go off. This indicates that registration is complete and *Dualcom* is 'locked' onto a VDN base station.

If the SERVICE LED does **not** remain on solid after 45 seconds, registration has failed. This is normally due to low (or no) signal strength. If the site survey and radio signal strength prediction (see page 5) indicated a suitable signal strength, check the aerial connections, power supply signal strength LEDs and then repeat the registration procedure.

During registration:
1. *Dualcom* logs (up to 14) base stations that it can hear.
2. *Dualcom* will 'lock' onto the base station with the strongest signal.
3. The VDN network enables the *Dualcom* to send alarms.

All of these three functions **must** be completed before registration is successful and signals can be passed to the ARC.

Occasionally during installation it may be necessary to 'Force Register' a *Dualcom*. If this action is required you will be informed by a Help Desk. Following Force Registration you **must NOT move the Power Switch to the Off position for 24 hours, and you must NOT disconnect the internal battery for 24 hours**. The **external** power to *Dualcom* may be removed for short periods and re-connected as required during the 24 hour period.

Using the CS1050 Expander Board

The CS1050 is a plug-on board that adds an additional 8 inputs and 8 outputs to the CS1000 and CS2000 range of *Dualcom* units.

To install:

1. Remove power to the *Dualcom* when fitting or removing the CS1050 Expander board.

2. Slide the CS1050 Expander into the two guides on the *Dualcom* with the white connector towards the *Dualcom* board. Push the CS1050 down to ensure it connects fully to the *Dualcom*.

3. Connect the triggering inputs to the INPUT terminals labelled 9 to 16, as required. See page 13 and Appendix 2.

4. Connect the outputs to the OUTPUT terminals, labelled 1 to 8, as required. These outputs are 'open collector pull-down to 0v. Each will supply up to 50mA and may operate lights or relays with a supply up to +28 volts. Where relays are used, they should be fitted with a diode across their coil to reduce 'back EMF' voltages. See Fig 7.

   Note: If you use a seperate Power Supply, remember to connect the 0v terminals of **all** of the parts of the system.

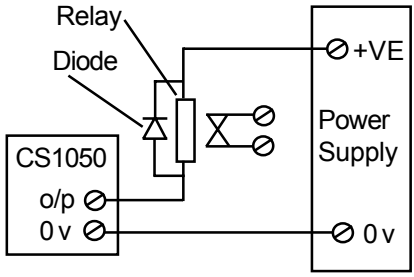


Fig 7

The *Dualcom* NVM will need to be programmed for '16 channels' enabled. Your ARC will normally provide a programming service. If a programming service is unavailable, contact the CSL Technical Support Desk. See page 10.

All of the normal input programming options apply to the CS1050 Expander. These are: Positive applied / removed triggering, self learning, restore reporting, open/close reporting, VDN failure report, PSTN failure report and alarm abort.

Fault Output

The fault relay contacts, C, NO and NC operates if the PSTN line is cut, the link to the Paknet base station signal is lost, after 3 unsuccessful call attempts are made on the PSTN or 10 unsuccessful attempts are made on the VDN.

Fig 8 details the Fault Relay operation in these various situations.

Fault	Panel Day	Panel Set	Panel Alarm
PSTN fault only	Continuous	2 sec pulse	Nothing
VDN fault only	Continuous	2 sec pulse	Nothing
Both PSTN & VDN	Continuous	Continuous	Continuous
3 attempts on PSTN	2 sec pulse	2 sec pulse	2 sec pulse
10 attempts on VDN	2 sec pulse	2 sec pulse	2 sec pulse
Total fail PSTN & VDN	Continuous	Continuous	Continuous

Fig 8

Aux Output

The Aux relay contacts, C, NO and NC can be programmed to :

a) Change state if a tellback signal is generated by the alarm abort sequence or is sent to *Dualcom* from a remote centre using the CS1054 Programming and Downloader software.

b) Change state when *Dualcom* has successfully communicated with the ARC.

Note: On the Plug On version, these terminals are not fitted and the relevant signals are automatically fed via the plug-on pins to the control panel.

If the CS1050 Expansion module is fitted, a 8 further outputs are provided. See page 19. These can be remotely controlled via the VDN radio path using the CS1054 Downloading Software.

For a full list of programmable features see instructions for the CS1054 Dualcom Programmer.

Telephone Line Connection
There are several different types of telephone line available from service providers.

DigiCom, *Dualcom*, the CSL range of Control Panels and most other intruder alarm equipment requires an **analogue** telephone line connection. 'Earth Loop Calling' or 'Earth Calling' types of analogue telephone line can **not** be used.

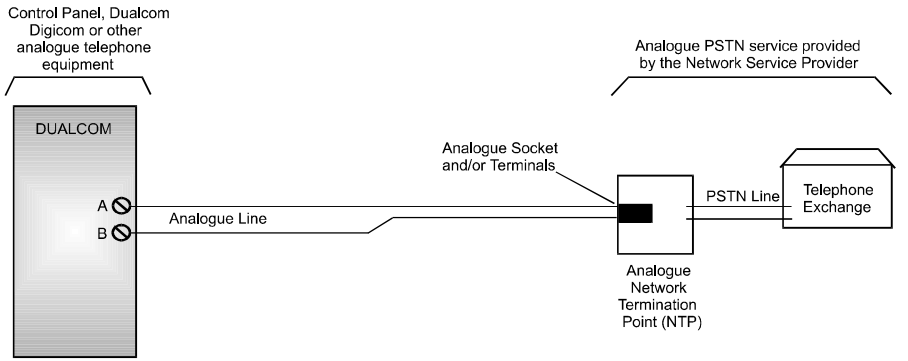
Equipment that requires an **analogue** line can **not** be connected **directly** to **digital ISDN** or **digital or hybrid ADSL** telephone lines.

Details of these lines and connections follow.

Analogue PSTN Telephone Line
The analogue PSTN is a communication network where the line from the exchange equipment and the service supplied to the subscriber is 'analogue', i.e. not 'digital'.

A telephone line is always terminated at the users premises by an NTP (Network Termination Point) which is provided by the Telecoms Service Provider. This is a socket or connection where the users equipment can be connected. Some NTPs provide a socket **and** terminals for connection. In many cases, the NTP operates using power supplied from the exchange equipment via the telephone line. See Fig 9.

An **analogue PSTN** telephone line may be provided by BT or any of the other 44 telecomms service providers in UK. *Dualcom* can be connected to this analogue line. See Fig 9. Refer also to the 'safety Earth' and the 'Call Minder' sections.



Analogue PSTN Telephone Line
Fig 9

PSTN Line Connection Options
Dualcom's line connection requires an **analogue telephone line.** For connection to other types of telephone line, refer to the previous pages.

Connecting other telecoms equipment IN PARALLEL to the analogue telephone line used by *Dualcom* (or any Digital Communicator) can stop the unit sending alarm calls to an Alarm Receiving Centre. Parallel connection is NOT recommended for *Dualcom* when it is used in a security system.

There are several ways that a *Dualcom* may be connected to a PSTN telephone line particularly when other equipment needs to share the same telephone line. Some require that your Telecom Service Provider supplies particular line features. Some require NVM programming options. Refer also to the 'Safety Earth' and the 'Call Minder' sections.

The highest security PSTN line for *Dualcom* (Recommended):
A PSTN line supplied as 'outgoing calls only', i.e. Incoming Ringing Barred,
AND the PSTN line is ex-directory,
AND the PSTN line goes to the *Dualcom* ONLY. Other equipment can be connected to the *Dualcom* A1 & B1 terminals (i.e. series connection) to make outgoing calls only. See next page.

The next best security option for a PSTN line (Recommended):
A PSTN line supplied with the '3-way calling' feature,
AND the *Dualcom* NVM is programmed for '3-way calling',
AND the PSTN line goes to the *Dualcom* ONLY. Other equipment can be connected to the *Dualcom* A1 & B1 terminals (i.e. series connection) for incoming and outgoing calls. See page 21.

The 'no security' option (!!! NOT Recommended !!!):
A PSTN line supplied without 'outgoing calls only' or the '3-way calling' feature. This option can **not** cancel or 'hold' incoming calls and these **will** inhibit *Dualcom* from making a telephone call to the Alarm Receiving Centre.

The 'parallel connection' option (!!! NOT Recommended !!!):
The *Dualcom* A & B terminals connect to the telephone line,
AND other equipment connects directly to the same telephone line.
This connection option can **not** cancel or 'hold' incoming or outgoing calls and these **will** inhibit *Dualcom* from making a telephone call to the Alarm Receiving Centre.

PSTN Line Connection (*Dualcom* alone on line)
Your Telecom Service Provider should be asked to supply and fit an analogue line and an NTP with terminals near the alarm system. The alarm installer should then follow steps 1, 2 and 4 below. See Fig 10.

Note : If *Dualcom* is connected to the PSTN line **and** a telephone or other equipment is sharing the same line (Parallel Connection) the bell in the telephone may tinkle when *Dualcom* is operating. *Dualcom* alarm calls to the Alarm Receiving Centre **will** also be inhibited. See previous page.

Series Connection (*Dualcom* & other equipment on line)
Your Telecom Service Provider should be asked to supply and fit an analogue line and an NTP with terminals near the alarm system. The alarm installer should then follow steps 1 - 4 below. See Fig 11.

1. Use cable type 1/0.5mm CW1308, feed through the cable entry, connect the cores to the *Dualcom* terminals marked A and B.

2. Connect the other end of the cable to the Terminal Block connections for the incoming telephone line, marked A & B, or 2 & 5.

3. If the PSTN line used by *Dualcom* is shared with other apparatus (e.g. telephone, fax or answer machine) connect the terminals marked A1 and B1 on the *Dualcom* to a PSTN Socket. (Terminals 1 & 6 in the NTP can be used as 'loop in points' for this purpose). The customer may then plug their phone, fax etc, into that socket.

4. On *Dualcom* and other equipment with an Earth or 'E' terminal, connect a 1.0mm earth cable to Terminal E. Ensure that the other end of this earth cable is connected to a good ground earth. This protects the equipment from high voltages, e.g. lightning, that may strike the telephone line. Refer also to the 'Safety Earth' section.

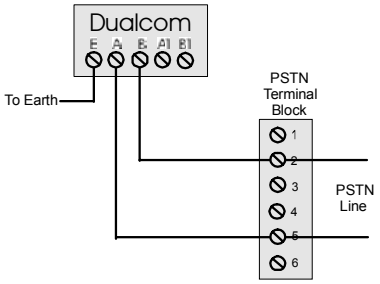


Fig 10

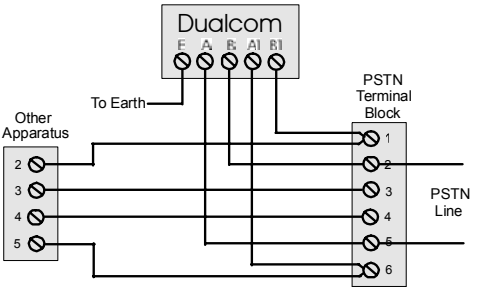


Fig 11

PABX (Private Automatic Branch Exchange)
A PABX is a telephone exchange in one business or building (where a dial 9 is needed for an outside line). It connects to one or more outside telephone lines and has two or more extentions within the business or building. See Fig 12.

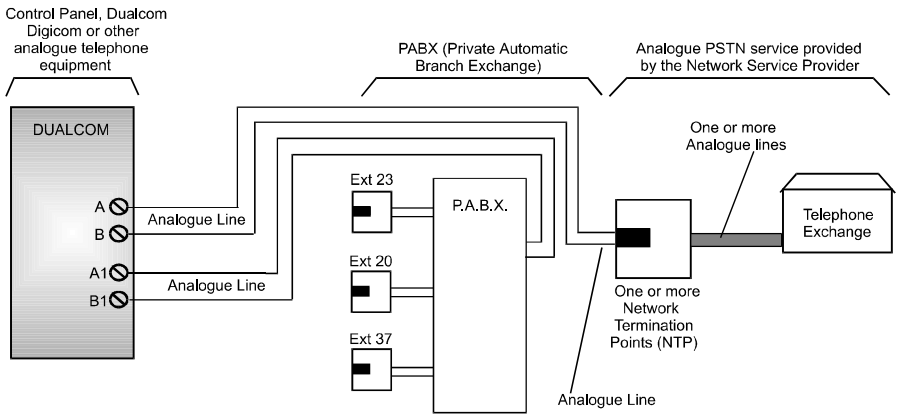
Dualcom may be connected to one of the outside telephone lines where they are the analogue PSTN type.

The extentions within the building may be analogue or digital. Where an extention is **analogue**, a normal phone or fax machine may be connected. *Dualcom* can be connected here and programmed to dial a 9. See Fig 13.

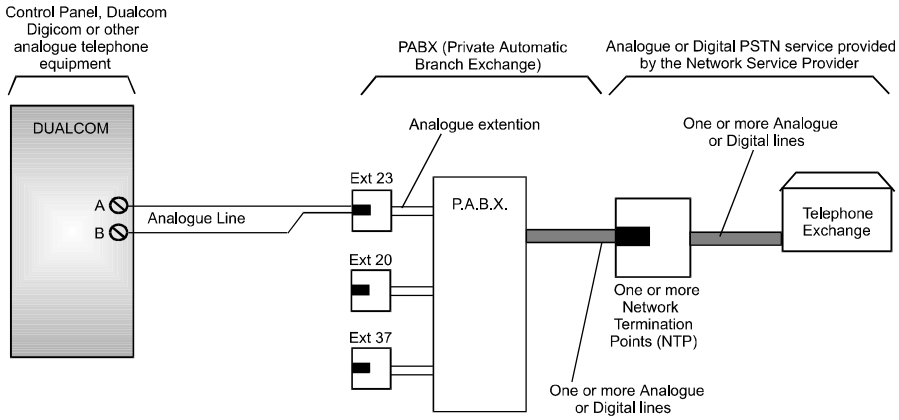
Where the extention is digital it is often to the ISDN standard or is a special digital standard that is particular to the manufacturer of the PABX equipment. Where a special digital standard is used, then a special 'feature phone' is usually required, provided by the manufacturer of the PABX equipment.

Dualcom can **not** be **directly** connected to any type of digital telephone line.

Refer also to the 'Safety Earth' and the 'Call Minder' sections.



PABX with connection to Analogue PSTN Line
Fig 12



PABX with Analogue extension

Fig 13

ISDN (Integrated System Digital Network)

The digital ISDN is a communication network where the line from the exchange equipment and the service supplied to the subscriber is ‘digital’, i.e. not ‘analogue’.

An ISDN line is a digital telephone line that conforms to the international ISDN standard. It can carry several calls simultaneously. A ‘basic rate’ ISDN telephone line can carry the equivalent of two simultaneous calls. In UK, a ‘basic rate’ ISDN line is called ISDN2 or ISDN2e. A ‘primary rate’ ISDN line can carry the equivalent of up to thirty simultaneous calls. In UK, a ‘primary rate’ ISDN line is called ISDN30.

An ISDN line is always terminated at the users premises by an NTP (Network Termination Point) which is provided by the telecoms Service Provider. The NTP is a socket or connection where the users equipment can be connected.

The service supplied to the user from the NTP may vary. The digital connection on the NTP is called the S-Bus. The S-Bus allows many different types of digital communication equipment to be connected, e.g. an ISDN interface card in a PC.

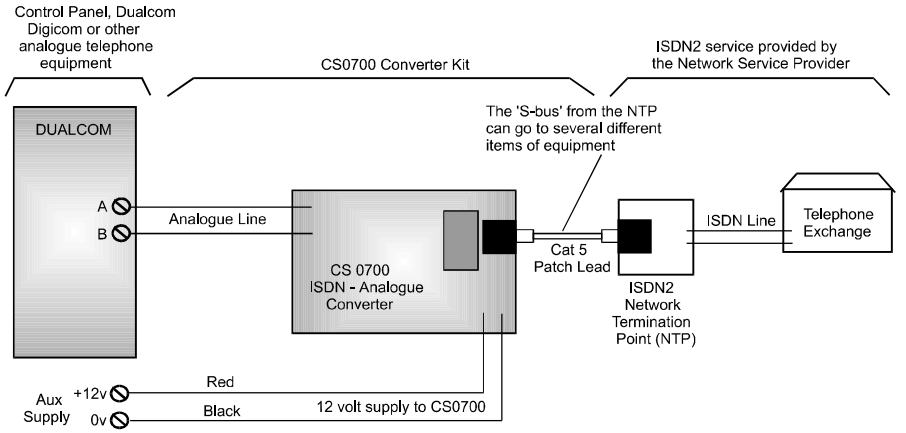
In many cases, the ISDN NTP operates using power supplied from the exchange equipment via the ISDN telephone line, however some types of NTP may require a connection to the mains supply at the users premises. Some ISDN NTPs include a converter to provide analogue sockets (e.g. Home Highway); See below.

ISDN2e (Integrated System Digital Network, 2 channel)
A 'basic rate' ISDN telephone line can carry the equivalent of two simultaneous calls. In UK, a 'basic rate' ISDN line is called ISDN2 or ISDN2e. Some suppliers call an ISDN2e line 'Home Highway' or 'Business Highway'. See below.

Where an ISDN2 line is fitted but an analogue line is required, e.g. for *Dualcom*, then the CSL CS0700 ISDN-Analogue converter may be used. The CS0700 has some important features especially for security communications including override' line grab'. Refer to the CS0700 manual and see Fig 14.

Dualcom can **not** be **directly** connected to a digital telephone line.

An ISDN2 line can be provided as 'point-to-point' or 'point-to-multipoint'. Where there is only one item connected to the S-bus then a 'point-to-point' service is OK. Where **two or more** items are connected to the S-bus then a '**point-to-multipoint**' **must** be provided.



ISDN2 Line + CS0700 Converter
Fig 14

Home Highway, Business Highway
Home Highway or Business Highway is the marketing name for a 'basic rate' ISDN2 line supplied by BT with an NTE9 NTP.

The NTE9 NTP provides two S-Bus sockets, it includes an ISDN-Analogue converter and two analogue telephone sockets. This type of NTP can have an analogue phone, fax, modem etc.connected at either or both of the analogue telephone sockets. *Dualcom* may be connected to these analogue connectors. See Fig 15.

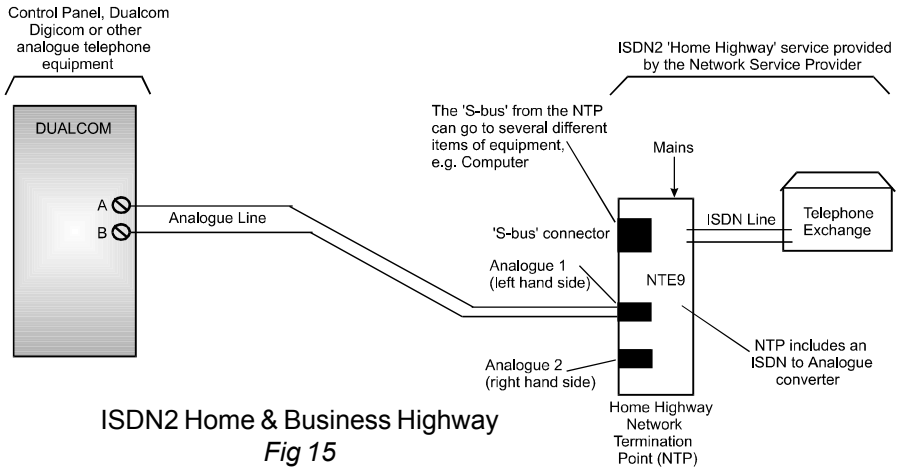
Power for the NTE9 comes from the exchange equipment via the ISDN line **and** also from the mains supply at the users premises.

Home Highway, Business Highway (continued)
In the event of mains failure, the right-hand analogue telephone socket on the NTE9 will cease to operate but all other functions are powered from the exchange equipment. It is important therefore to connect *Dualcom* to the left-hand analogue telephone socket on the NTE9. See Fig 15.

A maximum of two calls on an NTE9 may be in progress at the same time. Use of one analogue telephone socket constitutes one call. Use of the S-Bus on either S-Bus socket constitutes one or two calls (64 or 128 K byte bandwidth). If two calls are in progress it is **impossible** to make another outgoing call or receive another incoming call.

The 'two call maximum' means that if either of the S-Bus sockets are being used and a telephone call is in progress on one analogue socket, then anybody ringing into the other analogue telephone socket will get a 'busy' signal. Equally any connection to the other analogue socket, e.g. a telephone at the user's premises, will not hear the dialling tone and will not be able to dial out. Note that an over-ride 'line grab' facility does **not** exist on an NTE9.

Refer also to the 'safety Earth' and the 'Call Minder' sections.


Control Panel, Dualcom Digicom or other analogue telephone equipment
ISDN2 'Home Highway' service provided by the Network Service Provider
DUALCOM
A
B
Analogue Line
The 'S-bus' from the NTP can go to several different items of equipment, e.g. Computer
Mains
'S-bus' connector
ISDN Line
Telephone Exchange
Analogue 1 (left hand side)
NTE9
NTP includes an ISDN to Analogue converter
Analogue 2 (right hand side)
Home Highway Network Termination Point (NTP)

ISDN2 Home & Business Highway
Fig 15

ISDN30 (Integrated System Digital Network, 30 channel)
A 'primary rate' ISDN line can carry the equivalent of up to thirty simultaneous calls. In UK, a 'primary rate' ISDN line is called ISDN30.

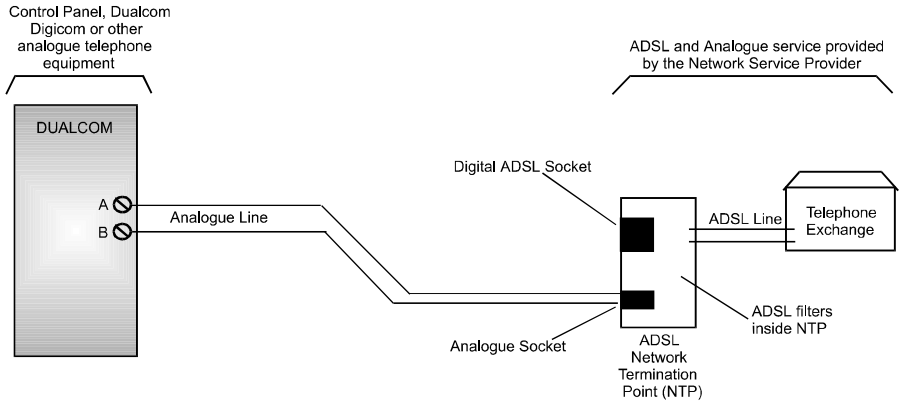
This is a digital telephone line that conforms to the international ISDN standard. It can carry up to 30 simultaneous telephone calls. This type of digital teltephone line normally connects directly to a PABX telephone exchange. See Fig 13. Note that the CS0700 ISDN-Analogue converter is for ISDN2 lines not ISDN30.

ADSL (Asynchronous Digital Subscriber Line) or 'Broadband'

ADSL lines are sometimes called 'Broadband'. Many ADSL lines are Hybrid lines, i.e. they carry ADSL digital data and analogue telephone signals simultaneously. Some ADSL line NTPs provide an analogue socket; *Dualcom* can be connected to the analogue socket. See Fig 16.

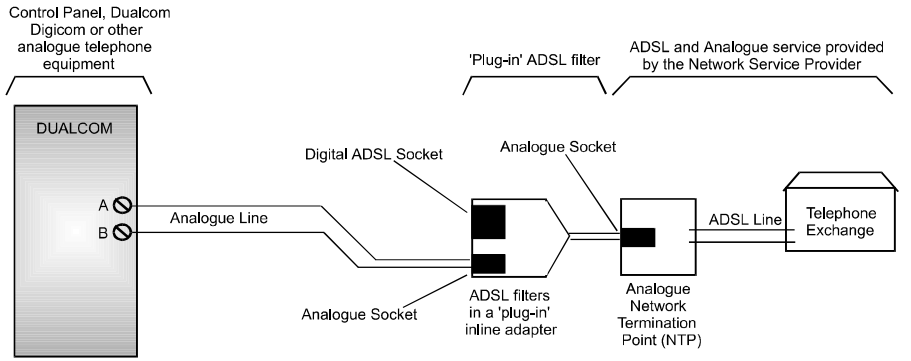
At the ADSL line NTP, a 'splitter' or filter is used to separate the low frequency analogue telephone signals from the high frequency ADSL data signals. The ADSL filters may be built into the NTP or they may be plug-in 'in-line' types. See Fig 17. Refer also to the 'Safety Earth' and the 'Call Minder' sections.

The NTPs that include ADSL filters are normally provided with a new installation. The plug-in 'inline' filters are normally provided on an analogue PSTN line that has been converted to an ADSL hybrid line. Contact your ADSL Service Provider for more information on ADSL lines or filters.



ADSL Hybrid Line (Filters in NTP)

Fig 16



ADSL Hybrid Line (Plug-in Filters)

Fig 17

The 'Call Minder' call answering Service
Some telecom Service Providers offer a call answering service. This will answer incoming calls if the subscriber's telephone is not answered within a number of rings. *Dualcom* NVM programming may need changing to ensure operation when this service is provided.

This service is available from BT in most areas of the UK on Analogue PSTN, ISDN, Home Highway and Hybrid ADSL lines. It may also be available from other telecom Service Providers. *Dualcom* may be connected to lines offering this service. See earlier connection information.

This service indicates to the subscriber that an earlier call has been recorded and should be heard by pulsing the dial-tone on subsequent calls. See the table below.

Dial Tone	Dialing	Answered calls
Continuous	You may dial	There are no answered calls
Pulsed	You may dial	There are answered calls waiting to be heard

The *Dualcom* NVM is normally programmed to require a dial-tone of 1 second before it will dial the number of the ARC to send its alarm information. When the dial-tone is pulsed as described above, the NVM programming **must** be changed to 0.1 second dial-tone detection to ensure correct operation.

Contact CSL Technical Support for more information.

Safety Earth connection
Some equipments require an Earth connection to meet the safety requirement of testing and approval, e.g. *Dualcom* & *DigiCom*. Other equipment designs provide electrical safety with no Earth connection, e.g. CS0700 Converter.

Where an 'E' or Earth connection is provided at the telephone line terminals of equipment, then this **must** be connected to an Earth point. See Fig 9 and 10.

Ideally, the Earth point should be an Earth stake in the ground, close to the equipment. Where this is unavailable, then a connection to the Mains supply Earth should be used.

System Power, Internal Battery & Power Saving

Dualcom ***Mk1*** requires a supply of 12-13.8 volts DC at 230mA in standby and 1.3 amps when activated. Transmissions taking this pulse of high current last for 1/10 second. The power supply **must** be able to provide this current.

For *Dualcom* ***Mk1***, a one amp power supply with standby battery is normally sufficient to provide power. A non-fused output should always be used to provide power to communication devices. Where only fused outputs are available it is recommended that a one amp 'slow-blow' type of fuse is fitted to accomodate the short high-current requirements of *Dualcom Mk1* when it transmits. Refer to your power supply manual for fuse suitability.

Dualcom ***Mk2*** requires a supply of 12-13.8 volts DC at 230mA in standby and when activated. This current may rise to 450mA for several minutes when recharging the internal battery.

The **installer must ensure** that the Alarm System power supply is rated to provide **adequate power** for this apparatus and for any other auxiliary apparatus drawing power from the Alarm System power supply(s). See Fig 18.
Only power supplies conforming to EN60950, EN41003 or International Safety Standards should be used with this apparatus.

Where the *Dualcom* receives its power from a Power Supply that is additional to the alarm system, ensure that the 0 volt connection on the additional power supply is connected to the 0 volt connection on the alarm system.

Dualcom ***Mk2*** includes a power switch or jumper. Moving the Power Switch to the Off position (or removing the Power Jumper Link) will disconnect the external supply **and** the internal battery thus fully powering-down the *Dualcom*. See Fig 2.

When transporting *Dualcom* ALWAYS disconnect the internal battery to stop the battery operating the *Dualcom* until it is discharged.

DO NOT supply power to the *Dualcom* directly from the power supply / control panel BATTERY terminals because this may bypass the current limited charging circuits found in many modern power supplies. This can result in discharged power supply batteries and low battery indications being sent to the ARC.

System Power, Internal Battery & Power Saving (continued)

Dualcom Mk2 includes an **internal** battery that ensures continued reporting and monitoring (typically 2 hours with a fully charged internal battery) even in the event of a total power failure to the *Dualcom Mk2*. This battery also provides the higher current that *Dualcom* requires when it is transmitting. This battery is disconnected when *Dualcom* is supplied. Connect the battery during installation and allow it to charge for a few minutes before use. See Fig 2.
Note: The internal battery provides improved performance and reliabliity. It does NOT replace Control Panel or PSU standby batteries.

On *Dualcom Mk2, w*hen power is re-applied after a power failure or during installation, the internal battery will be recharged. If the internal battery is completely discharged the *Dualcom* supply current may rise to 450mA for a short period. A completely discharged internal battery will normally recharge within 20 hours.

The supply (internal battery and external PSU) will be automatically tested with a short duration high current load every hour. If the supply fails this test a low-battery signal will be transmitted to the Alarm Receiving Centre.

Dualcom includes some advanced power saving features. In the event of total power failure to *Dualcom*, the unit will continue to operate on its internal battery. Total power failure to *Dualcom* will be signalled to the ARC as a battery fault 10 minutes after it occurs. This delay avoids unnecessary reporting during installation. Thereafter the *Dualcom* will go to low-power mode.

Low-power mode following a power supply failure is indicated by the Red and Green signal strength LEDs both pulsing On and Off once per second.

Low-power mode will inhibit the hourly load checks on the internal battery and reduce the current required by *Dualcom* from 230mA to about 30mA. Low-power mode allows the unit to operate for longer on the remaining battery power. When power is restored above 12.0 volts the low-power mode is terminated and the normal-power mode is re-established.

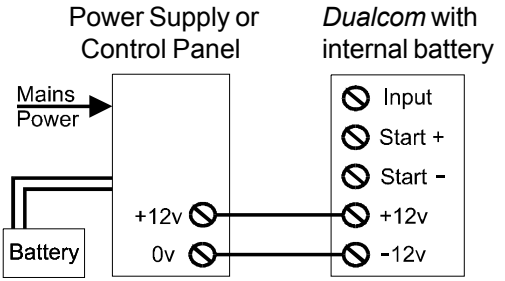


Fig 18

System Power, Internal Battery & Power Saving (continued)

During low-power mode, all functions continue to operate as normal but up/downloading is disabled and polling (see page 15) will fail. Alarm signals may still be sent (providing there is sufficient power to operate the unit) but an additional 30 seconds must be added to the reporting time.

The supply and internal battery voltage is continuously monitored. If this voltage has fallen to the 'low-battery voltage' a battery fault will be signalled to the ARC.

When power is restored above 12.0 volts and the low-power mode is terminated, a test call (or battery voltage restore signal) will be sent to the ARC. Polling will also be re-established.

If the external supply or internal battery voltage continues to fall below 10 volts there will be insufficient power to operate the unit and the batteries may suffer permanent damage. To protect against this, the *Dualcom* will switch off completely and stay off until the external supply is restored. **When Dualcom is switched off** up/downloading is disabled and **no alarm signals can be sent**.

Note:
The *Dualcom* 'Start' '+' & '-' terminals next to the 8 input terminals are voltage **outputs** to aid input triggering only. **These terminals are NOT the supply connector.** See Fig 1, 2 and Appendix 2.

NVM Programming

The operating parameters for *Dualcom*, e.g. Telephone Numbers are stored in the NVM (Non Volatile Memory). The NVM can be programmed by downloading to *Dualcom* via the VDN, or by using the CS1054 NVM Programmer connected to a PC.

Your Alarm Receiving Centre will normally provide a programming service and will supply programmed NVMs on request. Professional installers may also have the CS1054 and be able to provide a *Dualcom* programming and/or downloading service.

The CS1054 programmer and downloader is available for use with *Dualcom*. This runs on a PC and will allow any installation company to program, monitor and maintain their own *Dualcoms*. It also allows full control of access security to those *Dualcoms*. For more information, contact CSL.

Ensure that the *Dualcom* is powered-down before removing or inserting the NVM into its socket.

Calling

a) PSTN DTMF or Pulse Dialling
b) PSTN 3-way calling (Line Break Recall, BT Select Services)
c) Two telephone numbers for PSTN Alarm Reporting.
d) Two NUA Numbers for VDN Alarm Reporting
e) One NUA Number for Secure Callback via VDN.

Select Services

If the PSTN line for the *Dualcom* is not 'outgoing calls only', we recommend that your Telecom Service Provider's "Three Way Calling" service (if available) is enabled on the phone line. The NVM will need to be programmed with "3-way calling" enabled. This will ensure that *Dualcom* can make an outgoing PSTN call if the line is engaged by an incoming call. See page 21-29 for recommended connections for security applications.

Inputs 1 - 8

a) Trigger polarity (also programmed using the Self-learn facility. See page 13)
b) Restore Reporting.
c) Open and Close Reporting.
d) Input Channel Code.
e) Delayed Channel.

Automatic Test Calls

Periodic test calls can be sent automatically at intervals of 1 to 99 hours since the last call or at fixed intervals. Test calls will always be sent by both signalling paths.

PSTN Line Monitoring

a) 24 Hour DC Voltage.
b) 24 Hour Off Hook Detect.
c) 24 Hour Ringing Detect.
d) Regular Dial Tone Detect.
e) Pre-dial Ringing Detect.
f) Pre-dial Off Hook Detect.
g) Pre-dial Dial Tone Detect.

Security

Note: Up/downloading security features are NOT activated when Dualcom is supplied. Use of one or more features is recommended.

Dualcom should be protected from physical assault and tampering by being fitted inside a tamper protected enclosure forming part of the alarm system.

The *Dualcom* has two independent methods of stopping unauthorised up/downloading. These security features are for up/downloading only. They do **not** operate when the NVM is removed from the *Dualcom* and is plugged into a CS1054 NVM programmer connected to a PC.

A 'call-back' VDN number may be programmed so that the *Dualcom* always calls to its preset 'call-back' engineering number whenever up/downloading is requested.

A 6 digit access code may be programmed so that the *Dualcom* always requires this code whenever up/downloading is requested.

In addition, up/downloading can be inhibited when the alarm system is in the set state.

Note: These up/downloading security features are NOT activated when Dualcom is supplied. Use of one or more features is recommended.

VDN Aerial

The aerial is supplied with its bottom section fitted to the mounting bracket. The top section is supplied seperately in the foam packing. **Ensure that the aerial top section is fitted to the mounting bracket during installation.** Wrap spare coax onto the supplied reel. **Do not cut coax and rejoin.**

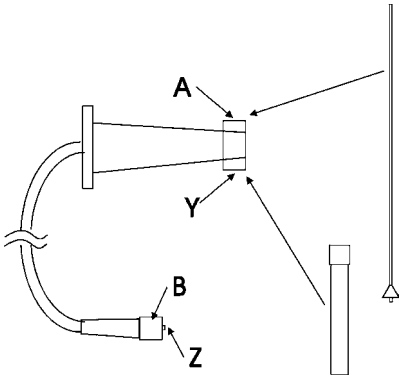


Fig 19

The *Dualcom* aerial, 8m coax lead and connector may be tested with a Resistance Meter. Fig 19 shows the aerial with the top and bottom sections unscrewed. The brass screw insert (A) for the top metal rod is marked TOP.

To test an aerial, unscrew the top and botton sections to allow access to the brass screw inserts. With a restance meter ensure that:

1. The resistance from A to Z is less than one ohm.
2. The resistance from B to Y is less than one ohm.
3. The resistance from A to Y is greater than one million ohms.

APPENDIX 1

LED Indications

The Signal Strength LEDs are Red and Green. See Fig 1 & 2.
The Signal Strength LEDs will give the signal strength indication that Dualcom is receiving, after *Dualcom* has been registered onto the VDN network (and the NVM is programmed). These are updated every second.

Green On, Red Off.	High Signal Strength
Red & Green On.	Medium Signal Strength
Red On, Green Off.	Low Signal Strength
Any of the above, plus... LED(s) On + short off-blink. (1 short off-blink per sec)	*Dualcom* can communicate with a local base station, VDN path status = OK.
Red Off, Green Off	*Dualcom* can not hear any base stations VDN path fault or signal strength = 0, OR... NVM is blank or programmed incorrectly.
Red & Green flashing on/off (Together, once per sec)	12 volt supply to *Dualcom* has failed. Low-power mode is active or will start within 10 minutes.

The Service LED is Yellow. See Fig 1 & 2
Registering indications may be seen.

Yellow Service LED Flashing for 45 seconds after power-up/reset	*Dualcom* is detecting VDN base-stations and registering onto the VDN communications network.
Yellow Service LED Flashing for less than 10 seconds after power-up/reset.	The NVM type is incorrect (should be 93C66N) or it is plugged into the socket incorrectly.
Yellow Service LED On solid.	*Dualcom* is locked onto a VDN base station. When registration has been successful then the radio path is operational.
Yellow Service LED Flashing Flashing later than 1 minute after power-up/reset.	*Dualcom* is searching for a VDN base station but is unable to hear any. The radio path will not operate.

LED Indications (continued)

The Communication LEDs are Red and Yellow. See Fig 1.
These give an indication of Power-up, Input Learning, NVM Faults, Communication Progress and Communication Faults.

NVM Fault Indications:
Immediately after power-up or after a Reset, NVM Fault indications may be given.

LEDS alternate flash - slow. (Red, yellow, red, yellow ...)	NVM is faulty, or fitted incorrectly.
LEDS alternate flash - fast. (Red, yellow, red, yellow ...) (On & Off 5 times per sec)	NVM is the correct type and is working, but has been incorrectly programmed, or is not programmed at all.

Input Learning Indication:
When the *Dualcom* is 'learning' the quiescent (non-active) state of its inputs, the Red & Yellow LEDs will flash, 4 Red...4 Yellow...4 Red...etc.

Up/Downloading indications:

LED On + 3 short off-blinks.	VDN remote programming of NVM in progress.

Alarm Communication indications:
After being triggered and throughout the communication process the callprogress may be seen.

LED Off	PSTN or VDN path not activated.
LED On solid.	Path activated or dialling numbers.
LED On + short off-blinks. (3 off-blinks per sec)	Dialling completed, waiting for 'handshake' from receiving equipment.
LED rapid flash. (On & Off 12 times per sec)	Handshake received, sending data to receiving equipment.
LED 15 medium flashes. (On & Off 5 times per sec)	Communications successful. Data received correctly at receiving equipment.

LED Indications (continued)

VDN Path Failure Indications:
The yellow Radio LED will flash to indicate a path failure.

LED slow flash	VDN path fault. The radio path will not operate

PSTN Line Failure Indications:
The red PSTN LED will flash to indicate the type of line or communication failure. If more than one type of failure is detected, the lowest number will be displayed.

Regular slow on-off flashing	The NVM is blank or it is not programmed correctly.
1 flash	PSTN telephone line DC voltage is very low or absent.
2 flashes	Another phone (or fax, modem etc.) on the same PSTN line is off-hook and may inhibit *Dualcom* from making a telephone call.
3 flashes	Incoming ringing is detected and this may inhibit *Dualcom* from making a telephone call.
4 flashes	The regular dial-tone test has failed indicating that there may be a PSTN line fault and this can inhibit *Dualcom* from making a telephone call. Check that the Service Provider is still providing a service (paid the bill?).
5 flashes	When *Dualcom* tried to make a telephone call, another phone (or fax, modem etc.) on the same PSTN line was off-hook and *Dualcom* could not make its call.
6 flashes	When *Dualcom* tried to make a telephone call, incoming ringing was detected, and *Dualcom* could not make its call.
7 flashes	When *Dualcom* tried to make a telephone call it failed to hear a dial-tone and could not make its call. See the Call Minder section.

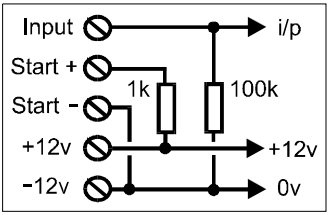
APPENDIX 2

Input Connections

There are 8 input terminals on *Dualcom* (16 with the CS1050 Expander).

When *Dualcom* is triggered the voltages on the input terminals are 0 volts changing to a positive voltage, (normally +4 volts to +12 volts), or they may be a positive voltage changing to 0 volts. This is called 'positive applied' or 'positive removed' triggering.

The Inputs may be programmed to send an alarm call when a positive voltage is **applied** to an input or when a positive voltage is **removed**. See the CS2054 NVM Programming Manual for details and the Self-learning feature on page 13.



Dualcom internal connections

The figure above shows the **internal** connections of the *Dualcom* inputs.

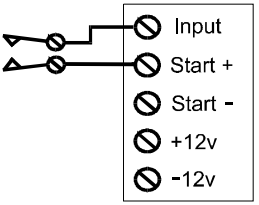
The +12 volt and 0v connections from the Control Panel or Power Supply is connected to the +12v & - 12v terminals.

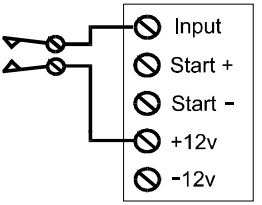
Each of the input terminals on *Dualcom* is connected to 0 volts by a resistor. Therefore, by leaving an input terminal unconnected this will ensure that that the input is connected to 0 volts.

The 'Start+' terminals on *Dualcom* is an output. It will give a positive'pull-up' voltage which can be used to assist input triggering.

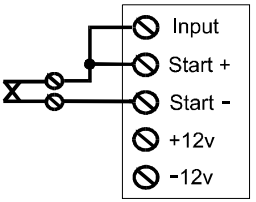
The 'Start-' terminal is hard connected to 0 volts and can be used to assist input triggering.

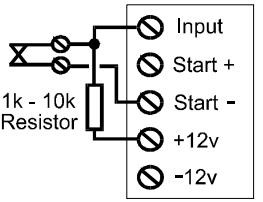
Input Connections (continued)



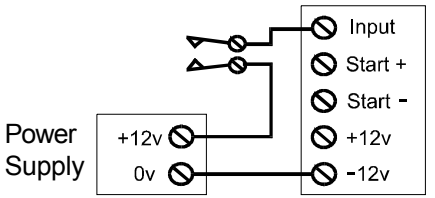


Examples of 'Positive Applied' triggering
Contact is 'Normally Open'. Input is normally at 0 volts.
When contact closes the input becomes +12 volts.

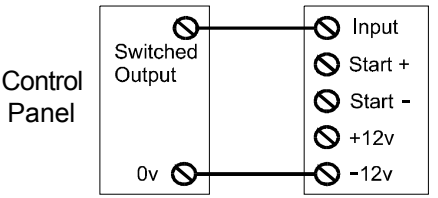




Examples of 'Positive Applied' triggering
Contact is 'Normally Closed'. Input is normally at 0 volts.
When contact opens the input becomes +12 volts.

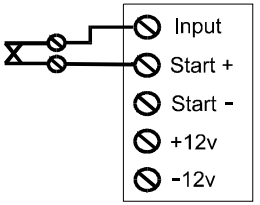


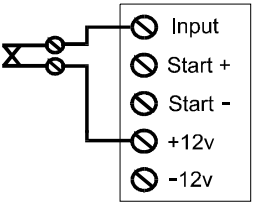
Example of 'Positive Applied' triggering
Contact is 'Normally Open'. Input is normally at 0 volts.
When contact closes the input becomes +12 volts.



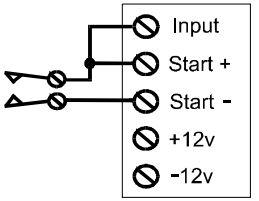
Example of 'Positive Applied' triggering
Control Panel Switched Output is 0 volts changing to a positive voltage

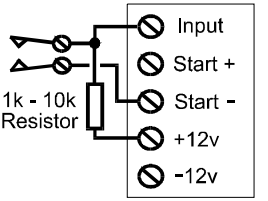
Input Connections (continued)



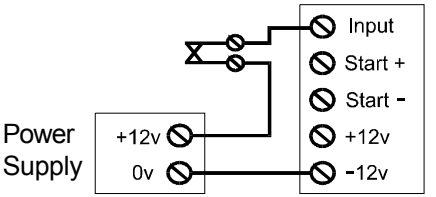


Examples of 'Positive Removed' triggering
Contact is 'Normally Closed'. Input is normally at +12 volts.
When contact opens the input becomes 0 volts.

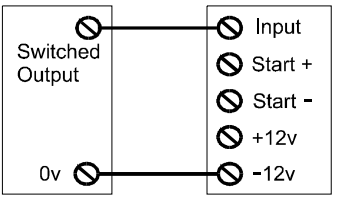




Examples of 'Positive Removed' triggering
Contact is 'Normally Open'. Input is normally at +12 volts.
When contact closes the input becomes 0 volts.



Example of 'Positive Removed' triggering
Contact is 'Normally Closed'. Input is normally at +12 volts.
When contact opens the input becomes 0 volts.



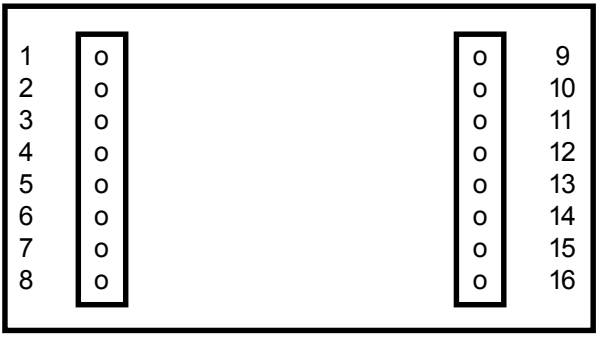
Example of 'Positive Removed' triggering
Control Panel Switched Output is a positive voltage changing to 0 volts

APPENDIX 3

CS1001 Plug-on Dualcom

The pins are mounted on the host unit, e.g. the control panel. The pins are fitted on a plastic spacer, 0.156 inches (3.96mm) pin centre to centre. There are two rows of 8 pins spaced apart by 4.25 inches (108mm) pin centre to centre.

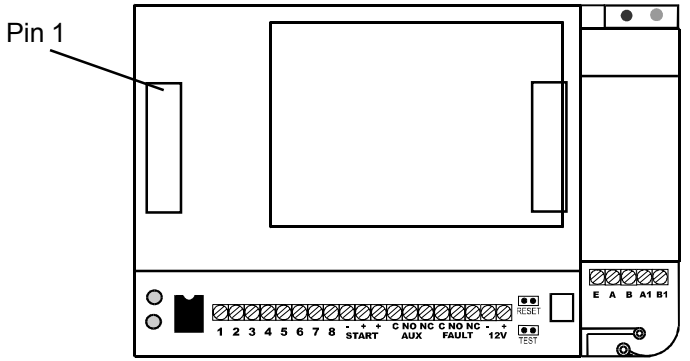
The view below is looking at the pins mounted on a host unit, onto which the *Dualcom* plugs. Note that some equipments label the pins 9-16 as '1-8'.



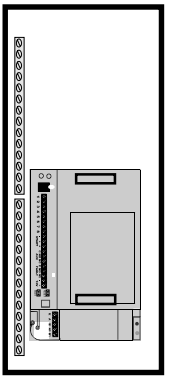
Pin Allocation

1	Input to Communicator	Input 1	Fire
2	Input to Communicator	Input 2	P.A.
3	Input to Communicator	Input 3	Burglar
4	Input to Communicator	Input 4	Open/Close
5	Input to Communicator	Input 5	(mains fail etc)
6	Output from Communicator	Tell Back	(comms successful)
7	Output from Communicator	Communications Fail	
8	Input to Communicator	Low Battery	
9	Input to Communicator	+12 volts	
10	Input to Communicator	0v	
11	no connection		
12	Input to Communicator	+5v	
13	Input to Communicator	Input 6	Bell active
14	Input to Communicator	Input 7	Alarm
15	Output from Communicator	PSTN Line Fail	
16	Output from Communicator	Reset host unit (not used)	

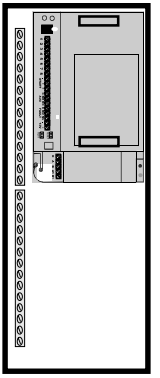
CS1001 Plug-on Dualcom (continued)



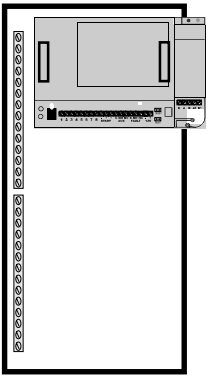
CS1001 Plug-on Locations



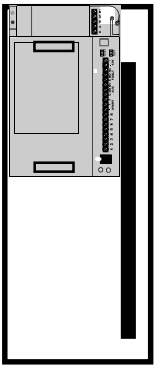
9100



9800



9600



9800 Plus

APPENDIX 4

Specification

Models	CS1000-20 Stand Alone and CS1001-20 Plug On
Dimension	(h x w x d) 125 x 172 x 62 mm
Weight	800 grams (includes internal battery)
Mounting	Any orientation.
Temperature	-20C to +60C transit, -4C to +50C operating
Humidity	0 - 80% non-condensing
Warranty	2 years
Telephone Path	PSTN technology. CTR21 approved.
Ringer Equiv. No. (REN)	1.0
Radio Path	Vodafone Data Network (VDN)
Battery	CS0380, 12 volt, 800mA/h Lead-acid gel
Battery Life	2 hours minimum from fully charged.
Abort Facility	Built In, selectable by programming
Power Requirement	12.0 - 15.0 volts DC, 0.1volt max ripple
Current Consumption	230mA quiescent + internal battery charge current 1A (totally flat internal battery being recharged)
Hourly battery test	Internal battery and external supply.
Low Battery	10.8-11.0 volts falling, 11.8-12.0v recovery
Inputs	8 expandable to 16 inputs using CS1050
Outputs	CS1000, 2 changeover relays (24v 1A contacts) CS1001, 5 volt logic levels 8 additional transistor outputs using CS1050
Start Inputs	Max +15 volt, Min 0 volts DC

Security Reference:

NATM9 NACOSS Guidelines for installing Paknet.

Regulatory Requirements

Before attempting to install *Dualcom*, the installer must be aware that the CS1000 range of *Dualcom* products may only be installed by a professional installer.

The Ringer Equivalence Number (REN) of the apparatus is 1.0. The sum of RENs of the individual items connected to one PSTN line should not exceed 4.

APPENDIX 5

European PSTN Approval

The CS1000 range of *Dualcom* products meet the requirements of the EU PSTN standard CTR21 and is approved for connection to any exchange line forming part of a Public Switched Telephone Network (PSTN).

AHCTR210 001 Declaration of Network Compatibility

The equipment has been approved in accordance with Council Decision 98/ / EC (5) for pan-European single terminal connection to the Public Switched Telephone Network (PSTN). However, due to differences between the individual PSTNs provided in different countries , the approval does not, of itself, give an unconditional assurance of successful operation on every PSTN network termination point.

In the event of problems, you should contact your equipment supplier in the first instance.

AHCTR211 001 Statement to Notified Body, Vendor and User

The equipment has been approved in accordance with Council Decision 98/ / EC (5) for pan-European single terminal connection to the Public Switched Telephone Network (PSTN).

The equipment has been designed for use in all 17 EU countries , plus Switzerland , but may have interworking difficulties in Germany and Greece.

For use in Portugal it is necessary to ensure that a programming master chip, CSL catalogue number CS2045-02 is used to ensure reliable operation with the Portuguese Telephone Network.

Approval Authority:	**CE0168**
Approval Number for Dualcom range:	**608777**

UK Paknet Radio Approval

The CS1000 range of *Dualcom* products incorporate an independently tested & approved VDN radio module that meets the requirements of UK radio communication standards.

Approval Authority:	**CE0165**

APPENDIX 6

Glossary of Terms

ADSL Asynchronous Digital Subscriber Line

A 'wideband' digital communication service from a network provider to a subscriber that carries a high volume of digital data, most commonly for internet access. Sometimes called 'Broadband'. An ADSL service is often provided with a simultaneous analogue PSTN service on a Hybrid line.

Alarm Abort

A facility to reduce false alarms requiring police response. Specified by ACPO (The Association of Chief Police Officers) in UK. An Alarm Abort situation occurs when the alarm system is set, and an alarm occurs, and then it is reset by the alarm system being unset by a key or valid user code, all within 90 seconds.

This false alarm is often caused by the user of an alarm system failing to set the system correctly. The Alarm Abort signal identifies this situation to the ARC thus avoiding an unnecessary police visit to the site.

Analogue PSTN Analogue Public Switched Telephone Network.

The analogue national telephone system. Often just called the PSTN. Service is available to customers on twisted-pair wires that carries a DC supply provided from the network telephone exchange.

ARC Alarm Receiving Centre

See ARS

ARS Alarm Receiving Station

A 24 hour manned centre (often privately owned & operated) capable of receiving & logging calls of alarm and forwarding them to security authorities and other relevant services. Often called a Central Station.

Broadband

See ADSL

Call Minder

A call answering service offered by some telecom Service Providers. When an incomming call to the subscriber's telephone is not answered, then the Service Provider can record it and forward it to the subscriber at a later time.

Central Station

See ARS

Glossary of Terms (continued)

Digital PSTN Digital Public Switched Telephone Network.
The digital national telephone system. Service is available to customers on twisted-pair wires that carries a DC supply provided from the network telephone exchange, on optical fibre or other digital transmission medium. The digital service may be in ISDN format or another digital format.

DTMF Dual Tone Multi Frequency
The series of tones used by telephones to send dialling information to an analogue PSTN exchange. These tones are also used by the DTMF Fast Format and Contact ID alarms reporting protocols.

DTMF Fast Format Alarms Reporting Protocol
A protocol that is a sequence of analogue tones (push-button telephone tones) used to send via telephone lines a transmission to receiving equipment at an ARC, and to receive checking and acknowledgement replies from that receiving equipment. 8 or 16 channel DTMF Fast Format protocol is commonly used in burglar or intruder alarm equipment.

Earth Loop Calling
An older type of analogue PSTN or analogue PABX extention line. Normally provided with no DC voltage present on the line. Requires the line to be connected to earth to obtain a 'dial tone'. CSL Dualcom, Digicom and Control Panel Digi-Modems can not be used with this type of telephone line.

EEPROM Electrically Erasable Programmable Read Only Memory.
A type of NVM. See NVM

FSSI Forward Signal Strength Indication
This is a value indicating the radio signal strength recieved at a *Dualcom*.or VDN radio PAD from the base station.

Hybrid Line
A line that carries digital data and analogue signals simultaneously. Most commonly this is an ADSL digital service and an analogue telephone service on one line from a Service Provider to a subscriber.

ISDN Integrated Services Digital Network
A digital communication network where services are provided via electrical or optical cables. This may also be a digital PSTN. The network is usually provided as a 2 channel or 30 channel ISDN service.

Glossary of Terms (continued)

ISDN 2 2 Channel ISDN

An ISDN communication service where two simultaneous channels may be used. Each channel is normally a 64 KiloBit/sec serial data path. Each path may typically carry one speech telephone call, or an internet connection or a fax call.

ISDN 30 30 Channel ISDN

An ISDN communication service where thirty simultaneous channels may be used. Each channel is normally a 64 KiloBit/sec serial data path. Each path may typically carry one speech telephone call, or an internet connection or a fax call.

NTP Network Termination Point

A telephone line is terminated at the users premises by a Network Termination Point which is provided by the Telecomms Service Provider. This is a socket or connection where the users equipment can be connected.

NVM Non Volatile Memory.

An integrated circuit memory device that does not need any power to remember data.

PABX Private Automatic Branch Exchange

A small telephone exchange for use within one building or group of buildings. Commonly used in businesses where each phone in that business is an extention on that PABX. Usually connects to one or more analogue PSTN or ISDN telephone lines.

PAKNET Packet Network.

See VDN

PSTN Public Switched Telephone Network.

A national telephone system. This may be analogue and/or digital. See Analog PSTN.

RSSI Reverse Signal Strength Indication

This is a value indicating the radio signal strength recieved at the base station from a Dualcom.or VDN radio PAD.

Terminal Adapter

A Device that connects to the S-bus connection of an ISDN Network Termination Point and adapts the digital S-bus data, i.e.protocol, data speed, structure, to that required. E.g. the conversion may be to analogue PSTN or to a serial port for cable connection to a PC serial ‘COM’ port.

APPENDIX 6

Glossary of Terms (continued)

VDN Vodafone Data Network (Paknet)

A private communication system operated by Vodafone in UK for users that are not mobile, for carrying digital data (not speech) where the path from the user is by a radio link to one (or more) fixed sites.

WEB SITE The CSL Internet Web Site

The CSL web site: *www.csldual.com* contains the latest copies of all manuals for all CSL products. Please ensure that you are working from the latest version. You can also download associated information and software samplers. CSL sales, shipping and contact information is here too.

3-Way-Calling

This is a service provided by some telecommunication service providers. BT in UK offer this service. When a call is in progress on a telephone line it is possible to send a signal via that line to the equipment at the telephone exchange. The exchange will put the current call on 'hold' and provide a dialling tone so that another outgoing call may be made. When this second call has finished a signal to the exchange will disconnect the second call and re-connect the first one that was put on 'hold'.